VI Semester Syllabi – Information Technology

Sr. No.	Course Code	Course Name	L	T	P	Credits
1.	IT3CO13	Cloud Computing	3	1	2	5
2.	IT3CO14	Object Oriented Analysis and	3	1	2	5
3.	IT3EL	Elective 3	3	0	0	3
4.	IT3EL	Elective 4	3	0	0	3
5.	IT3OE	Open Elective 1	3	0	0	3
6.	IT3OE	Open Elective 2	3	0	0	3
7.	EN3MC02	Technical English	2	0	0	0
		Total	**20**	**2**	**4**	**22**
		Total Contact Hours	**26**			

S. No	Course Code	Course Name	L	T	P	Credit
1	IT3EL03	Information Storage and Management	3	0	0	3
2	IT3EI08	Information Security	3	0	0	3
3	IT3EI06	Cyber Ethics and Laws	3	0	0	3
4	IT3EL05	Ad hoc Networks	3	0	0	3
5	IT3EA06	Natural Language Processing	3	0	0	3
6	IT3EA04	Pattern Recognition	3	0	0	3

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
IT3CO13	Cloud Computing	3	1	2	5

UNIT I

Introduction to cloud computing, characteristics of cloud computing as per NIST, cloud reference model, application of cloud computing ECG analysis, protein structure prediction, cloud deployment models.

UNIT II

Virtualization, virtualization advantages, Full virtualization, para-virtualization, hypervisors. Cloud interoperability, cloud service management, cloud analytics, Cloud broker, Capex, Opex, cloud architecture.

UNIT III

Platform as a service, Infrastructure as a service, software as a service, Desktop as a service, Backup as a service, DRaaS, Introduction to SLA, SLA lifecycle, SLA management, Business continuity plan.

UNIT IV

Cloud security fundamentals, vulnerability assessment, security architecture, identity management and access control, data at rest, data in flight, data in motion, security in virtualization.

UNIT V

Cloud application development platforms, Xen hypervisor, AWS, Google app engine, open stack.

Text Books

1. S. Chand,R.Buyya, C. Vecchiola, S.T. Selvi, "Mastering Cloud Computing," McGraw Hill Education
2. T. Velte, A. Velte and R. Estenpeter, "Cloud Computing –A practical approach, McGraw Hill Education

Reference Books

1. K. Chandrasekaran, "Essentials of Cloud Computing," CRC Press
2. Thomas Erl, Zaigham Mahmood, RichardoPuttini, Cloud Computing: Concepts, Technology & Architecture, ServiceTech press
3. K Jayaswal, J Kallakurchi, Donald Houde, Deven Shah, Cloud Computing Black Book, Dreamtech Press

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
IT3CO14	Object Oriented Analysis and Design	3	1	2	5

UNIT I

Structure of Complex Systems, Object Oriented Development Methods, Characteristics of Objects, Fundamental Concepts of Object orientation, UML- Overview, RUP and its Phases

UNIT II

Models, Concepts in UML, Structural and Behavioral Models, Use Cases and functional Requirements, Use Case Descriptions, Classes, Relationships, Association, Generalization, Realization, Dependencies, Constraints

UNIT III

State Machine View, Activity View, Interaction View, Sequence Diagram, Collaboration Diagram, Interaction Diagrams

UNIT IV

Physical View, Component Diagram, Deployment Diagram, Package, Dependencies on Packages, Modelling System and Subsystems, Patterns and Types of Patterns, Applying Patterns

UNIT V

Object Oriented Testing, Types of Testing, Quality Assurance Methods, Reusability, Reverse Engineering, Case Studies

Text Book

1. Grady Booch, Object Oriented Analysis and Design with Applications, Addison Wesley
2. James Rambaugh, Ivar Jacobson, Grady Booch, The Unified Modelling Language Reference Manual, Addison Wesley

Reference Book

1. Erich Gamma, Richard Helm, Ralph Johnson, John Vissides, Design Patterns - Elements of Reusable Object-Oriented Software, Addison-Wesley
2. Craig Larman ,Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, Pearson Education
3. Garry Pollice, David West, Brett McLaughlin, Head First Object Oriented Analysis and Design, O'Reilly Media Inc.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
IT3EI08	Information Security	3	0	0	3

UNIT-I

Introduction to Information Security: Security Attacks, Security Services, Classical Encryption Techniques, Symmetric Cipher Model, Substitution techniques, Transposition techniques, Steganography.

UNIT-II

Block Cipher Principles, Data Encryption Standard (DES), Differential and Linear Cryptanalysis, Modular Arithmetic, Euclidean Algorithm, Advanced Encryption Standard (AES).

UNIT-III

Public key cryptography: Principles of Public key Cryptosystems, RSA algorithm, Key Management, Diffie Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

UNIT-IV

Message Authentication and Hash Functions: Message Authentication codes, Secure Hash Algorithm, HMAC, Digital Signature, Authentication Protocol, Digital Signature Standards.

UNIT V Authentication Applications: Kerberos, X.509 Authentication service, Pretty Good Privacy, S/MIME, IP Security,-Firewalls.

Text Book

1. Stallings William, Cryptography and Network Security, Pearson Education
2. William Stallings and Lawrie Brown, Larry Brown ,Computer Security: Principles and Practice, Pearson

References Book

1. Matt Bishop, Introduction to Computer Security, Addison-Wesley
2. Buchmann J. A., Introduction to Cryptography, Springer Verlag
3. Schneier Bruce, Applied Cryptography, John Wiley an d Sons
4. Atul Kahate, Cryptography and Network Security, TMH

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3EL05 / IT3EL05	Ad hoc Networks	3	0	0	3

UNIT I

Introduction to Ad hoc networks, Definition, characteristics features, applications, characteristics of wireless channel, architecture of Ad hoc network.

UNIT II

Medium access protocol MAC, design issues, goals, classification, contention-based protocols, IEEE standards 802.11, 802.15 and HIPERLAN.

UNIT III

Routing protocols for Ad hoc Network, Design issues, classifications, Table driven routing protocol, Destination Sequenced Distance-Vector Routing Protocol, Cluster-Head Gateway switch routing protocol, On Demand routing protocol, Dynamic source routing protocol, Ad hoc On Demand Distance Vector Routing Protocol.

UNIT IV

Transport layer and security protocols for Ad hoc Network, design issues, goals, classifications, security in Ad hoc network, issues and challenges in security provisioning, Network security attacks.

UNIT V

Secure routing in Ad hoc network, requirement, security aware Ad hoc routing protocols, Introduction to wireless sensor network, Applications of sensor network, comparison with Ad hoc wireless network.

Text Books

1. C. Siva Ram Murthy and B.S. Manoj, Ad Hoc Wireless Networks Architectures and Protocols, Prentice Hall
2. Charles E. Perkins, "Ad hoc Networking," Addison-Wesley

Reference Books

1. Carlos de MoraisCordeiro and Dharma Agrawal,Ad Hoc and Sensor Networks: Theory and Applications, World Scientific
2. Mohammad Ilyas, The Handbook of Ad hoc Wireless Networks, CRC Press
3. C. K. Toh, Adhoc Mobile Wireless Protocol: Protocols and Systems, Pearson

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3EI06 / IT3EI06	Cyber Ethics and Laws	3	0	0	3

UNIT I

Introduction, Cyber Ethics, Need of Cyber Ethics, Intellectual Property (IP), IPR Governance, The World Intellectual Property Organization (WIPO)

UNIT II

Cyber Space, Cyber Law, Scope of Cyber Laws: Ecommerce; Online Contracts; IPRs (Patent, Trademarks, Copyright, Industrial Design, Geographical Indication), Right to Access, Right to Privacy, Cyber Law in India with Special Reference to Information Technology Act-2000.

UNIT III

Introduction to Computer and Cyber Crimes, Conventional Crimes, Identity Theft and Fraud, Cyber Terrorism, Cyber Defamation, Cyber Stalking, E Commerce Frauds, Social Engineering Attacks, Cyber Pornography, Forgery and Fraud, Crime related to IPRS.

UNIT IV

Cyber Jurisdiction: Introduction to Indian Evidence Act, Indian Patent Act, Introduction to Indian Penal Code, Bankers Book Evidence Act, RBI Act, Information Technology Act 2000 and Amendment in IT Act 2008.

UNIT V

Issues in Cyberspace, Issues Related to IPR, Issues Relating to Investigation, Domain Name Dispute, Issues Relating to Jurisdiction, Issues Relating to Evidence, Case Study: Cyber Crimes.

Text Books

1. Dr.R.K.TiwariP.K.Sastri,K.V. Ravi Kumar, "Computer Crime and Computer Forensics", First.
2. Verma SK, Mittal Raman, legal dimension of Cyber Space, Indian Law Institute, New Delhi

Reference Books

1. Vinod V. Sople, "Managing Intellectual Property" PHI Learning Private Limited.
2. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi
3. Understanding Forensics in IT, PHI Learning.
4. IT Act 2000 Details www.mit.gov.in

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3EL01 / IT3EL03	Information Storage and Management	3	0	0	3

UNIT-I

Introduction to Storage Technology: Data proliferation, evolution of various storage technologies, Overview of storage infrastructure components, Information Lifecycle Management, Data categorization.

UNIT-II

Storage Systems Architecture: Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, RAID levels & parity algorithms, hot sparing, Front end to host storage provisioning, mapping and operation.

UNIT-III

Introduction to Networked Storage: JBOD, DAS, NAS, SAN & CAS evolution and comparison. Applications, Elements, connectivity, standards, management, security and limitations of DAS, NAS, CAS & SAN.

UNIT –IV

Hybrid Storage solutions; Virtualization: Memory, network, server, storage & appliances. Data center concepts & requirements, Backup & Disaster Recovery: Principles Managing & Monitoring: Industry management standards (SNMP, SMI-S, CIM), standard framework applications, Key management metrics (Thresholds, availability, capacity, security, performance).

UNIT-V

Information storage on cloud :Concept of Cloud, Cloud Computing, storage on Cloud, Cloud Vocabulary, Architectural Framework, Cloud benefits, Cloud computing Evolution, Applications & services on cloud, Cloud service providers and Models, Essential characteristics of cloud computing, Cloud Security and integration.

Text Books

1. G. Somasundaram & Alok Shrivastava (EMC Education Services), Information Storage and Management, Wiley India.
2. Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein, Storage Network Explained, Wiley India.

References

1. John W. Rittinghouse and James F. Ransome; Cloud Computing : Implementation , Management and Security, CRC Press, Taylor Frances Pub.
2. Nick Antonopoulos, Lee Gillam; Cloud Computing : Principles, System & Application, Springer.
3. Tom Clark, Storage Virtualization, Pearson Education

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3EL06 / IT3EL06	Internet of Things	3	0	0	3

UNIT I

Introduction: Definition, Characteristics of IOT, why IOT, Wireless Sensor Structure–Energy Storage Module–Power Management Module–RF Module–Sensing Module, IOT Conceptual framework, IOT Architectural view, Physical design of IOT, Logical design of IOT, Application of IOT.

UNIT II

Machine-to-machine (M2M), M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as aService (XaaS), M2M and IoT Analytics, SDN (software defined networking) and NFV(network function virtualization) for IOT, data storage in IOT, IOT Cloud Based Services.

UNIT III

Design Principles for Web Connectivity: Web Communication Protocols for connected devices, Message Communication Protocols for connected devices, SOAP, REST, HTTP Restful and Web Sockets. Internet Connectivity Principles: Internet Connectivity, Internet based communication, IP addressing in IOT, Media Access control.

UNIT IV

Sensor Technology , Participatory Sensing, Industrial IOT and Automotive IOT , Actuator, Sensor data Communication Protocols ,Radio Frequency Identification Technology, Wireless Sensor Network Technology.

UNIT V

IOT Design methodology: Specification -Requirement, process, model, service, functional & operational view. IOT Privacy and security solutions, Security Requirements in IoT Architecture Raspberry Pi &arduino devices. IOT Case studies: smart city streetlights control & monitoring.

Text Books

1. Rajkamal,"Internet of Things", Tata McGraw Hill publication
2. Vijay Madisetti and ArshdeepBahga, "Internet of things(A-Hand-on-Approach)" 1st Edition ,Universal Press
3. HakimaChaouchi "The Internet of Things: Connecting Objects", Wiley publication. 4. Charless Bell "MySQL for the Internet of things", Apress publications.

Reference Books

1. Francis dacosta "Rethinking the Internet of things:A scalable Approach to connecting everything", 1st edition, Apress publications 2013.
2. Donald Norris"The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black", McGraw Hill publication.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3EA07 / IT3EA07	Machine Learning	3	0	0	3

UNIT I

Introduction to machine learning, Applications, prediction, decision making, inference; Supervised Learning: Distance-based methods, Nearest-Neighbors, Decision Trees, Naïve Bayes; Linear models: Linear Regression, Logistic Regression

UNIT-II

Classification: Generalized Linear Models, Support Vector Machines, Nonlinearity and Kernel Methods, Beyond Binary Classification: Multi-class/Structured Outputs, Ranking

UNIT III

Unsupervised Learning: Clustering: K-means/Kernel K-means, Dimensionality Reduction: PCA and kernel PCA, Matrix Factorization and Matrix Completion, Generative Models (mixture models and latent factor models)

UNIT IV

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests), Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data

UNIT V

Deep Learning and Feature Representation Learning, Scalable Machine Learning (Online and Distributed Learning), Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference

Text Book

1. Machine Learning, Tom Mitchell, McGraw Hill.
2. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press.
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer (freely available online)

Reference Books

1. Christopher Bishop, Pattern Recognition and Machine Learning, Springer.
2. Hal Daumé III, A Course in Machine Learning (freely available online)
3. Sebastian Raschka, VahidMirjalili, Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow, Packt Publishing.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3EA07 / IT3EA05	Evolutionary Algorithms	3	0	0	3

UNIT I

Optimization background and terminology: Gradient optimization methods, sampling methods, linear programming, combinatorial optimization. Principles of Evolutionary Process, A History of Evolutionary Computation, strengths and weaknesses of the evolutionary model. Inductive bias.

UNIT II

Evolutionary Biology background and terminology: Genotype and phenotype, unit of selection, genes and traits, chromosomes, alleles, diploid and haploid, fitness, mutation and recombination. Selection, variation and landscapes. Genetic Algorithms: Representation, operators, and standard algorithm. The building block hypothesis and the schema theorem.

UNIT III

Evolutionary strategies: Evolution in continuous variables. Transformations. Genetic Programming. Building blocks and architecture-altering operators. Libraries and Trees. Selection mechanisms: Fitness proportionate, rank, tournament, Stochastic Universal Sampling and Boltzman selection methods. Niching methods. Spatial methods. Consequences of selection models.

UNIT IV

Artificial landscapes and test functions: The Two-armed bandit problem. Multi-modal and deceptive functions. Royal roads. N-k landscapes. Hierarchical and fractal functions. Pareto evolution.

Co-evolution: Multiple populations and single-population co-evolution, relative and absolute fitness, engagement and gradient loss, the red queen effect. The credit assignment problem. Swarm intelligence, particle swarm optimization

UNIT V

Neural Network Structures ,Perceptrons, Training Single Layer NNs, Training Multilayer NNs: Back Propagation, Empirical Risk Minimization, Optimization Methods and Generalization, Artificial Neural Networks for Classification and regression, Multilayer Feedforward Neural networks with Sigmoidal activation functions; Backpropagation Algorithm; Representational abilities of feedforward networks , Evolutionary Neural Networks

Text books

1. Melanie Mitchell, An introduction to genetic algorithms, MIT
2. John Koza et al, Genetic Programming IV - Routine Human-Competitive Machine Intelligence, Morgan.

Reference books

1. Goldberg D.E. Genetic Algorithms in Search, Optimization and Machine Learning, Pearson Education.

2. K. Shrinivasa Raju and D. Nagesh Kumar, Multivriterion Analysis in Engineering and Management, PHI Learning.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
IT3EA06	Natural Language Processing	3	0	0	3

UNIT-I

Introduction: Human languages, Knowledge in speech and language processing – Ambiguity – Models and Algorithms – Language, Thought and Understanding Formal language and Natural Language, Finite state transducer.

UNIT-II

Morphology: Inflectional morphology, Derivational morphology, Finite state morphological parsing, Morphology and Indian languages.

N-Grams: Simple N-grams, Smoothing, Backoff, Entropy.

UNIT-III

Part-of-Speech Tagging: Stochastic POS tagging, HMM, Transformation based tagging (TBL), Handling of unknown words, Named entities, Multi word expressions.

Speech Processing: Speech and phonetics, Vocal organ, Phonological rules, Probabilistic models- Spelling error, Bayesian method to spelling, Minimum edit distance, Bayesian method of pronunciation variation, Viterbi algorithm, HMM and Speech recognition.

UNIT-IV

Parsing- Unification, Statistical Parsing, Probabilistic parsing, TreeBank.

Semantic Analysis: Syntax-Driven semantic analysis – Attachments for a fragment of English – Integrating semantic analysis into the early parser – Idioms and compositionality – Robust semantic analysis.

UNIT-V

Application: Sentiment analysis, Spelling correction, Word sense disambiguation, Machine translation, Text Classification, Question answering system, Information retrieval and tasks.

Text Books

1. Daniel Jurafsky& James H.Martin, "Speech and Language Processing", Pearson Education (Singapore) PTE.Ltd.
2. James Allen, "Natural Language Understanding", Pearson Education.

Reference books

1. C.Manning and H.Schutze, "Foundation of statistical Natural Language Processing" MIT Press
2. Steven Bird, Ewan Klein, Edward Loper, Natural Language Processing with Python, O'Reilly
3. Bhargava SrinivasaDesikan, Natural Language Processing and Computational Linguistics, Packt Publishing Limited

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
IT3EA04	Pattern Recognition	3	0	0	3

UNIT- I

Overview of pattern recognition , Supervised learning, Bayes Decision Theory: Minimum-error-rate classification, Classifiers, Decision surfaces, discrete features, discriminant function, ; Decision trees: CART

UNIT- II

Dimensionality reduction: Fisher discriminant analysis; Principal component analysis; Factor Analysis, Support vector machines

UNIT- III

Parameter Estimation Methods: Maximum-Likelihood estimation: Gaussian case; Maximum a Posteriori estimation; Bayesian estimation: Gaussian case

UNIT- IV

Unsupervised learning and clustering: Criterion functions for clustering; Algorithms for clustering: K-Means, Hierarchical and other methods; Cluster validation; Gaussian mixture models; Expectation-Maximization method for parameter estimation; Maximum entropy estimation

UNIT- V

Sequential Pattern Recognition: Hidden Markov Models (HMMs); Discrete HMMs; Continuous HMMs, Support vector machines, K-Nearest Neighbour method, Parzen window

Text Book:

1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley
2. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press

Reference Books:

1. C.M.Bishop, Pattern Recognition and Machine Learning, Springer
2. Tou and Gonzales, Pattern Recognition Principles, Wesley Publication Company, London